WHAT IS CLAIMED IS:

1. A modified three lobe search method of finding a vertical velocity of a vehicle, comprising:

(a) transmitting at least three acoustic pulses from a vehicle submerged in water toward a bottom surface;

(b) detecting a returned acoustic pulse due to each of the transmitted acoustic pulses on the vehicle, after the transmitted acoustic pulses are reflected toward the vehicle from the bottom surface;

(c) generating a first cost function from a time that is related to said acoustic pulses;

(d) obtaining an independently estimated vertical velocity of the vehicle;

(e) performing Fletcher-Powell cardinal searches on the first cost function beginning with the independently estimated vertical velocity, to find a main lobe velocity at a minimum value of a lobe of the first cost;

(f) adding a lobe spacing velocity increment to the main lobe velocity, to determine a first side lobe velocity; and

(g) subtracting a lobe spacing velocity increment from the main lobe velocity, to determine a second side lobe velocity.

2. A modified three lobe search method of finding a vertical velocity of a vehicle, comprising:

(a) transmitting at least three acoustic pulses from a vehicle submerged in water toward a bottom surface;

(b) detecting a returned acoustic pulse due to each of the transmitted acoustic pulses on the vehicle, after the transmitted acoustic pulses are reflected toward the vehicle from the bottom surface;

(c) generating a first cost function from a time that is related to the acoustic pulses;

(d) obtaining an independently estimated vertical velocity of the vehicle;

(e) performing Fletcher-Powell cardinal searches on the first cost function beginning with the independently estimated vertical velocity, to find a main lobe velocity at a minimum value of a lobe of the first cost function;

(f) adding a lobe spacing velocity increment to the main lobe velocity, to determine a first side lobe velocity;

(g) subtracting a lobe spacing velocity increment from the main lobe velocity, to determine a second side lobe velocity;

(h) generating a second cost function from another time that is related to the acoustic pulses;

(i) using the main lobe velocity and first and second side lobe velocities in the second cost function to determine three cost values of the second cost function; and

(j) selecting a lobe velocity that corresponds to the lowest cost value of the determined three cost values of the second cost function.

3. A modified three lobe search method of finding a vertical velocity of a vehicle, comprising:

(a) transmitting at least three acoustic pulses from a vehicle submerged in water toward a bottom surface;

(b) detecting a returned acoustic pulse due to each of the transmitted acoustic pulses on the vehicle, after the three pulses are reflected toward the vehicle from the bottom surface;

(c) generating first and second cost functions from two times that are related to the acoustic pulses;

(d) obtaining an approximate estimate of the vertical velocity of the vehicle from an independent source;

(e) performing Fletcher-Powell cardinal searches on the first cost function that is determined beginning with the approximate estimate of the vertical velocity to find a main lobe velocity at a minimum of a lobe of the first cost;

(f) adding a lobe spacing velocity increment to the main lobe velocity to determine a first side lobe velocity;

(g) subtracting a lobe spacing velocity increment from the main lobe velocity to determine a second side lobe velocity;

(h) using the main lobe velocity and first and second side lobe velocities in the second cost function to determine cost values of the second cost function at said three lobe velocities;

(i) selecting a lobe velocity that corresponds to the lowest cost value of said three lobe velocities of the

second cost function; and

(j) performing Fletcher-Powell searches on the second cost function, beginning with the selected lobe velocity, to find a minimum lobe velocity at a minimum of a lobe of the second cost function, the minimum lobe velocity being taken as the vertical velocity of the vehicle.